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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/532,022	03/21/2000	Yuji Sudoh	35.G2558	7470

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EXAMINER

NGUYEN, HUNG

ART UNIT	PAPER NUMBER
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2851

DATE MAILED: 05/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/532,022

Applicant(s)

SUDOH ET AL.

Examiner

Hung Henry V Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Amendment filed 3/10/03.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 25-52 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 25-52 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 March 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 25-52 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The disclosure of the specification lacks adequate support for the claimed provision of “projection optical system including a diaphragm arranged in a vacuum” (see claim 1 for example). The applicants stated that support for the claimed limitations can be found in the specification as filed and directed the Examiner’s attention to the specification beginning at page 7, line 9 and particularly page 12, lines 13-20. However, the Examiner was unable to find the claimed limitations as mentioned in the specification except for an ambiguous statement stating “*the present invention is applied to an exposure optical system used in the atmosphere, the present is also applicable to an exposure apparatus using EUV or X-rays. In that case, the present invention is more effective, because exposure is performed in vacuum, and a natural radiation effect is reduced more, as compared with a case in which exposure is performed in the atmosphere*” (see present specification, page 12, lines 13-20). This paragraph is not even remotely related to the limitations as recited in the instant independent claims 25 and 37. The applicant is reminded that when claimed elements that are not clearly

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discussed in detail, this falls under 112, first paragraph, applicant's disclosure is lacking in this aspect and for this reason, one having ordinary skill in the art is unable to ascertain the particularities and the highlights of applicant's claimed invention.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 25-52 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to claims 25, 37, and 49-51, the recitation of "of "projection optical system including a diaphragm arranged in a vacuum" is vague and indefinite for the above reasons (see rejection under 35 U.S.C. 112, first paragraph".

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 49-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ushida et al (U.S.Pat. 5,530,518) in view of Shiraishi (U.S.Pat. 6,020,950) and further in view of Sato (U.S.Pat. 5,142,148)

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With regard to claims 49-52 Ushida et al (fig.1) discloses an projection exposure apparatus comprising: a projection optical system (10) for projection a pattern formed on a reticle (9) onto a photosensitive substrate (11) and a diaphragm (10a) for setting the numerical aperture of the projection optical system. Ushida lacks to show a mechanism for controlling the temperature of the diaphragm. Shiraishi (figs 4 and 5) teaches a projection optical system having a cooling member (see fig.5) for cooling the light shielding plate arranged therein whereby "the system is free from heat generation caused by light absorption" (see col.5, lines 15-18) wherein the cooling means comprises a cooling fluid circulation system (Ko,Ki). Ushida as ~~modified~~ ^{modified} by Shiraishi does not expressly disclose the diaphragm arranged in vacuum. Sato discloses an exposure apparatus where the aperture diaphragm is disposed in a vacuum for preventing from being contaminated (see col.2, lines 3-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teachings of Ushida, Shiraishi and Sato to obtain the invention as specified in claims 49-52. It would have been obvious to a skilled artisan to utilize the cooling means as taught by Shiraishi into the diaphragm of Ushida so that the numerical aperture diaphragm may be prevented from increasing its temperature due to absorption of light and thus a deviation of the projection optical system can be avoided and to place the diaphragm in a vacuum as suggested by Sato so that the diaphragm is prevented from damage caused by contamination.

7. Claims 25-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi et al (U.S.Pat. 4,475,223) in view of Ushida et al (U.S.Pat. 5,530,518) and further in view of Shiraishi (U.S.Pat. 6,020,950) and further in view of Sato (U.S.Pat. 5,142,148)

With regard to claims 25-48 Taniguchi et al discloses an exposure apparatus for performing exposure using X-rays (6) in a vacuum (2) (see col.4, lines 9-11) and comprising a projection optical system for projecting a predetermined pattern formed on a mask onto a substrate (see fig.4). Taniguchi lacks to show “a diaphragm arranged in vacuum and a cooling device which cools the diaphragm”. Ushida et al (fig.1) discloses an projection exposure apparatus having a projection optical system (10) for projection a pattern formed on a reticle (9) onto a photosensitive substrate (11) and a diaphragm (10a) for setting the numerical aperture of the projection optical system. Shiraishi (figs 4 and 5) teaches a projection optical system having a cooling member (see fig.5) for cooling the light shielding plate arranged therein whereby “the system is free from heat generation caused by light absorption” (see col.5, lines 15-18) wherein the cooling means comprises a cooling fluid circulation system (Ko,Ki). Sato discloses an exposure apparatus where the aperture diaphragm is disposed in a vacuum for preventing from being contaminated (see col.2, lines 3-16). In view of such teachings, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teachings of Taniguchi, Ushida, Shiraishi and Sato to obtain the claimed invention.

With respect to claims 31 and 43, it is noted that the temperature of fluid is controlled (see col.14, lines 5-7). Therefore, a temperature sensor is an inherent device of the cooling means to detect the temperature information of the light shielding plate.

As to claims 32-33, and 44-45, it is the examiner's position that it would have been obvious to a skilled artisan to preferably disposed the temperature sensor on the side facing the substrate. In other words, the sensor is disposed on a plane opposite to the light source whereby the sensor is not influenced by the exposure beam.

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It would have been obvious to a skilled artisan to employ a diaphragm as taught by Ushida into the exposure device of Taniguchi for adjusting the numerical aperture thereby improving the resolution of the images to be printed and to utilize the cooling means as taught by Shiraishi into the diaphragm of Ushida so that the numerical aperture diaphragm may be prevented from increasing its temperature due to absorption of light and thus a deviation of the projection optical system can be avoided and to place the diaphragm in a vacuum as suggested by Sato so that the diaphragm is prevented from damage caused by contamination.

8. Claims 34-35 and 46-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi in view of Ushida et al (U.S.Pat. 5,530,518) and further in view of Shiraishi (U.S.Pat. 6,020,950) and further in view of Sato and further in view of Nishi et al (U.S.Pat. 5,894,341).

As to claims 34-35, and 46-47, Taniguchi as modified by Ushida, as well as Shiraishi and Sato comprising substantially of the limitations of the instant invention as discussed above except for the aperture diaphragm comprises an iris diaphragm and a turret having a plurality of openings. However, a variable aperture of a turret type is known per se. For instance, Nishi teaches an aperture comprising "iris diaphragm and a turret with a plurality of openings". (see figs.2a, 2b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ a variable aperture of a turret type as taught by Nishi in the device of Ushida as modified by Shiraishi and Sato for varying the numerical aperture of the projection optical system.

As to claims 30 and 42, Taniguchi as modified by Ushida et al, Shiraishi and Sato lacks to show a cooling device with a "Peltier element". Using a "Peltier element" in a cooling

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mechanism is also well known in the art. For example, Nishi teaches Peltier element (30) for cooling the bottom face of the temperature adjustment plate (20). It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ "Peltier element" as taught by Nishi into the cooling device of Shiraishi for the purpose of cooling the aperture stop and thus the aperture stop can be prevented from increasing its temperature due to absorption of light.

Response to Amendment

9. Applicant's amendment filed March 10, 2003 have been entered. Claims 25, 32, 37 and 44 have been amended. New claims 49-52 have been added.

In response to the rejections of claims 25-48 under 35 U.S.C. 112, first and second paragraph, firstly, applicant argues that "it is clearly disclosed in the specification at lines 13 through 20 of page 12 that the invention is applicable to an exposure apparatus using EUV or X-rays and that the invention is more effective because the exposure is performed in a vacuum". The Examiner absolutely disagrees with the applicant since one having basic skill in the art would understand that "exposure is performed in a vacuum" is not even remotely related to "projection optical system including a diaphragm arranged in the vacuum". It also should be pointed out that the prior arts cited by the examiner relate to exposure apparatuses which are performed in vacuum. See, for example, Taniguchi et al. U.S. Patent 4,475,223, which describes an X-rays exposure apparatus, which is used to perform an exposure operation while the light source is displaced in a vacuum chamber. Ushida et al. U.S. Pat. 5,530,518, which describes an exposure apparatus having a projection optical system including a diaphragm and the exposure is

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performed while the wafer is hold by a vacuum source (a well-known structure in the art). Fact that, “exposure is performed in the vacuum” does not mean “a diaphragm” (which is a common element of an exposure apparatus) being arranged in the vacuum.

Secondly, the applicant argues that “the features of the use of X-rays in a vacuum and a diaphragm arranged in the vacuum are clearly supported by this disclosure since *there is no change in structure of or method of using the projection optical system with its diaphragm arranged in a vacuum whether X-rays or another radiation source is used or whether the arranging of a diaphragm is done in atmosphere or vacuum*”. Again, there is no evidence of record, other than applicant’s arguments which suggest that “exposure is performed in a vacuum” equates to “projection optical system including a diaphragm arranged in the vacuum”.

Finally, applicant refers to figures 3 through 5 and argues that since they “do not refer in any manner to a system operating in atmosphere and do not exclude a system operating in a vacuum as disclosed in page 12”; the Examiner disagrees with the applicant. Fact that the specification does not specifically disclose that the system is operated in atmosphere or do not exclude a system operating in a vacuum” does not mean that the specification teaches “projection optical system including a diaphragm arranged in the vacuum”. Clearly, applicant fails to disclose the details of the arrangement of the diaphragm in the projection optical system. The Examiner contends that it would require undue experimentation for one having ordinary skill in the art to make and use the claimed invention for the reason set forth herein above.

Turning to the prior art rejection, applicant’s arguments with respect to amended claims have been carefully reviewed but have been traversed in view of new grounds of rejection as set forth in sections 5-8 of this office action.

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10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

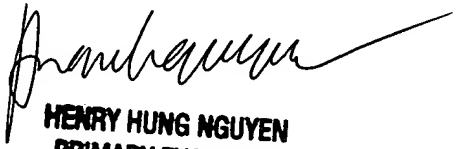
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung Henry V Nguyen whose telephone number is 703-305-6462. The examiner can normally be reached on Monday-Friday (First Friday off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Russ Adams can be reached on 703-308-2847.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4900.

hvn
May 2, 2003


HENRY HUNG NGUYEN
PRIMARY EXAMINER